

### What is the problem with browsing damage?

Browsing damage by mammals can affect growth rate and form of seedlings. If growth rate is reduced, the time to yield or the yield itself is reduced. If browsing results in double leaders, then the quality of the final product can be reduced. Control of browsing is essential to avoid partial or even complete loss of planting stock, and economic failure of the plantation.

### Which herbivores can damage your seedlings?

In Tasmania, three species of wild mammals, introduced animals and livestock can damage seedlings. Principal species are:

- Brushtail possum (brush possum or possum; *Trichosurus vulpecula*);
- Pademelon (red-bellied pademelon, rufous wallaby; *Thylogale billardierii*);
- Bennett's wallaby (sometimes called kangaroo; *Macropus rufogriseus*); and
- Rabbit, hare, fallow deer, etc.

### How long is browsing damage likely to be a problem?

Browsing damage can be a problem from the time seedlings go into the ground until they have reached about 1 to 2m in height. How long seedlings are vulnerable for depends on how quickly they grow. This depends on the species of seedling, the characteristics of the site where they are planted, plus how much they are being eaten. If growth is rapid, and browsing is kept to a minimum, seedlings can grow out of the range of browsers 'escape' within six months. If growth rate is poor and browsing is severe, seedlings may take a few years before they 'escape'. This means effective protection can reduce the time during which browsing is a problem.

Apart from damage to seedlings, brushtail possums also eat leaves from older trees. Usually this is not a problem for most plantation species. However, possums can also break branches - blackwood (*Acacia melanoxylon*) seems particularly vulnerable even if little of the foliage is eaten. Deer may damage the bark of pines until they are 8 years of age.

### What species of seedlings do herbivores prefer?

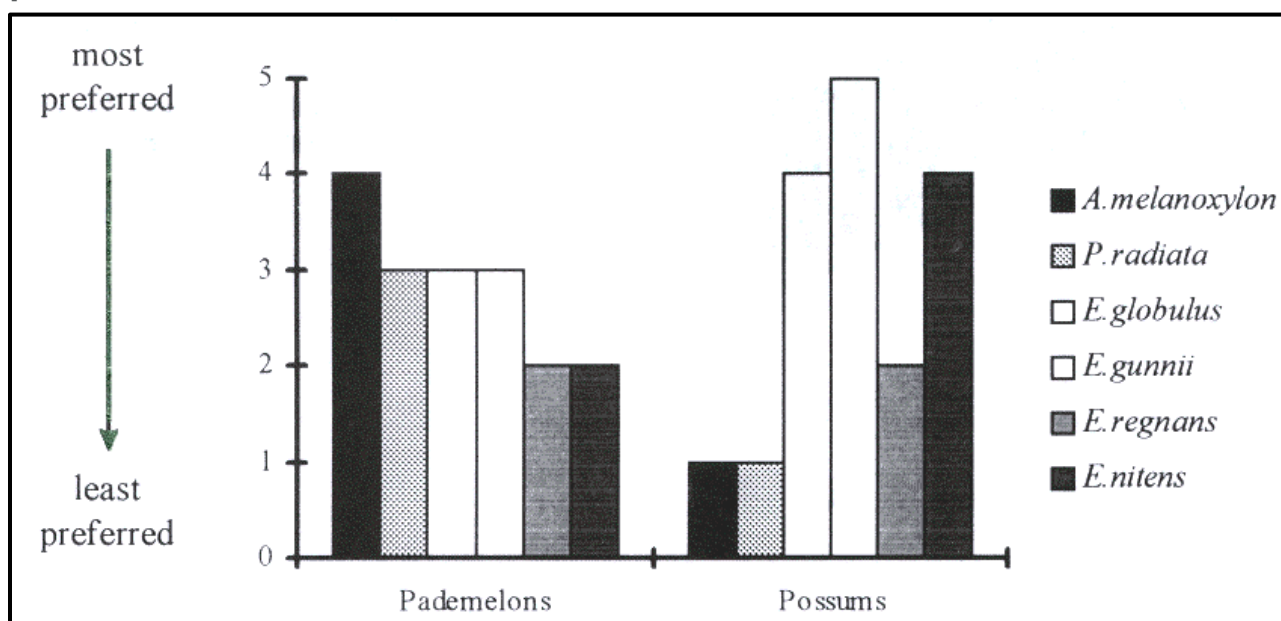
How much damage to seedlings the animals cause depends on which species is planted, what other food is available, and how hungry the animals are. Pademelons and possums, for example, prefer different seedlings (see Figure 1). An individual brushtail possum probably causes more damage to shining gum (*E. nitens*) and blue gum (*E. globulus*) seedlings than an individual pademelon or Bennett's wallaby, even in seasons when other food is available. Therefore, even if there is not much sign of possum, or few are seen compared with the wallabies, they may be doing much of the damage.

### Recognising browsing damage

In order to choose control measures to protect your seedlings, you need to know what is causing the damage. If seedlings are monitored too infrequently, you may mistake insect

damage for mammal damage. This mistake is less likely to occur over winter when there are fewer insects around to damage seedlings. Insect damage results in scalloped edges to leaves, and/or small holes. Mammal browsing results in jagged edges, and the stem may be eaten. If damage to a seedling is severe, it is not possible to tell insect from mammal damage or which mammal is causing the damage. Telling apart damage caused by possums, pademelons, Bennett's wallabies, rabbits/hare and deer is useful, but not always possible. **Table 1** provides a rule of thumb identification of herbivore damage. Usually more than one species will be causing the damage, because these species are often found together.

**Figure 1: Relative preferences for seedlings using captive pademelons and brushtail possums**



**Table 1: Rule of thumb identification of herbivore damage**

Type of early damage	Probable herbivore
Apical bud gone, only a few side leaves eaten	Possums
Only side leaves gone (not the apical bud)	Pademelons
Unknown	Bennett's wallaby
Seedlings snipped off at the base (hares also further up), some leaves lying around uneaten	Rabbits/hares
Bark stripping	Deer

Spotlighting, track pads and checking for scats in the area can all be used to determine which animals are around, to estimate their relative abundance, and to eliminate absent species as culprits.

**How much damage is too much?**

Too much damage depends on what the trees are being grown for. The loss of apical buds

may not only affect growth rate, but result in double-leaders. If form is important, minimising loss of apical buds is crucial. Individual seedlings usually do not get totally browsed in one go unless the damage is by rabbits/hares. Low levels of leaf loss do not significantly affect growth rate. At present, a conservative estimate is that if shining gum (*E. nitens*) seedlings have lost about 15-20% of their foliage through browsing, growth rate is not impeded.

### Protecting your seedlings and reducing effects of browsing damage

The simplest method of reducing the effects of browsing damage is to plant large seedlings. Large seedlings have a greater capacity than small seedlings to recover from the partial removal of the shoot that occurs during browsing.

You can protect your seedlings through a range of lethal and non-lethal methods. When native animals are implicated in causing damage, non-lethal methods should be considered first.

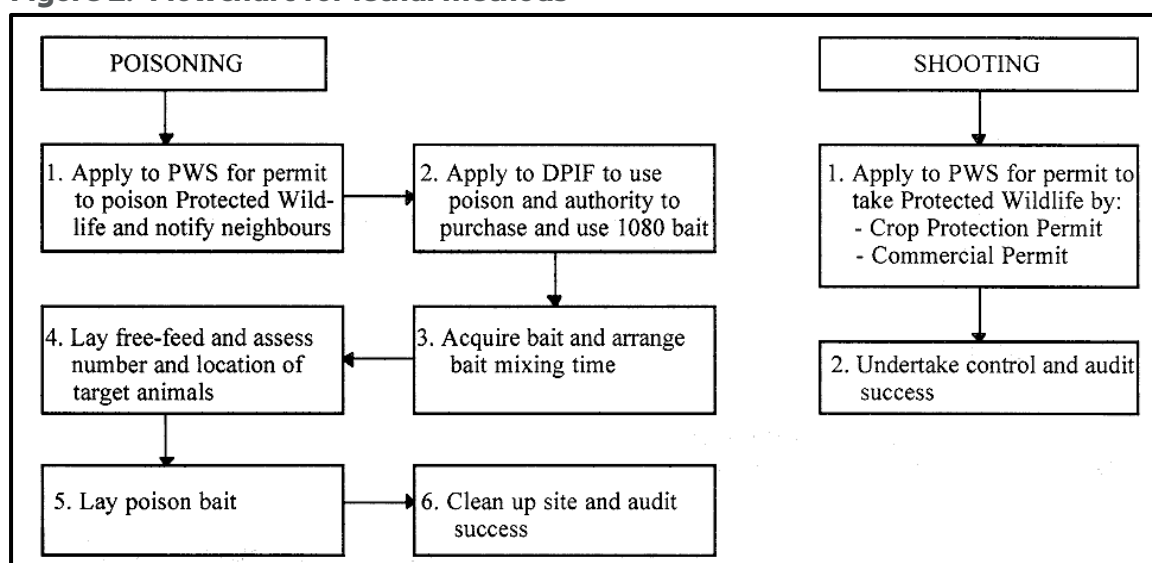
#### Lethal methods

- **Poisoning:** Sodium monofluoroacetate (1080) is a poison that ultimately causes either cardiac or respiratory failure. There is a risk of secondary poisoning, particularly to dogs, through scavenging of carcasses.
- **Shooting:** Shooting is more discriminatory than poisoning and can be effective if populations are low. If high, shooting requires a sustained effort if the factors that have led to the high population remain in place.

Poisoning and shooting can be combined effectively on agricultural land to reduce browsing damage.

***Poisoning and shooting of possums, pademelon, Bennett's wallaby and deer may only be undertaken with a permit issued by the Parks and Wildlife Service Tasmania (PWS). Follow the steps indicated in Figure 2.***

**Figure 2: Flowchart for lethal methods**



### **Non-lethal methods**

A range of non-lethal methods are available. For long-term protection against persistent browsing pressure, the only effective solution is fencing.

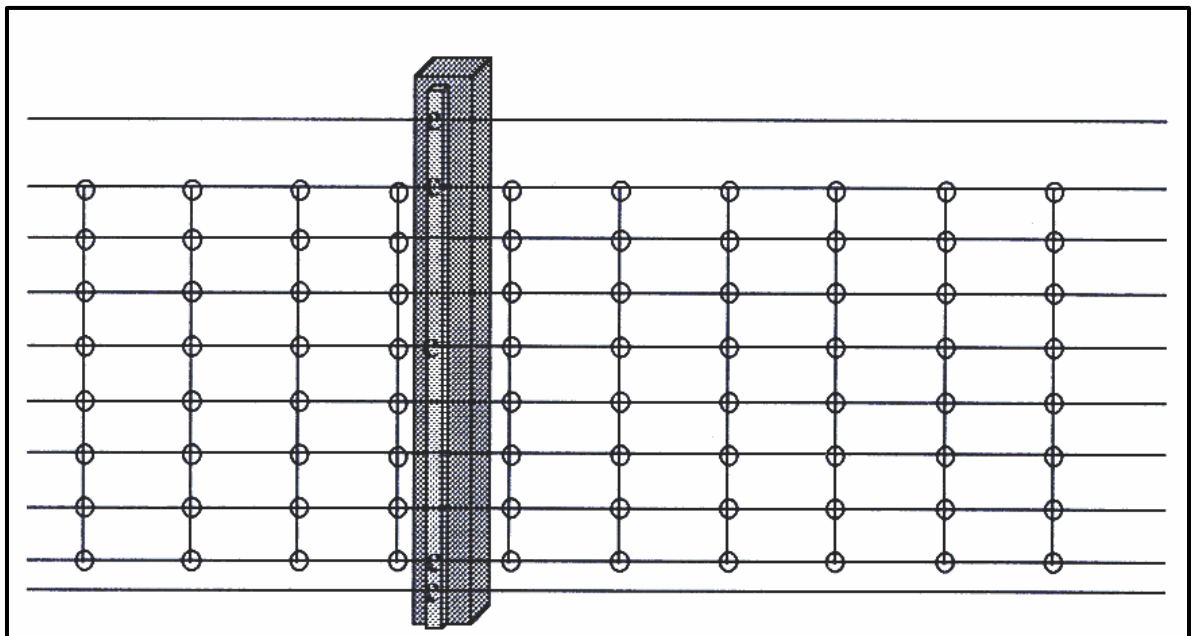
- **Trapping:** The only trapping of native species allowed is live-trapping and requires a permit. This is labour intensive and only effective against very low populations. Releasing trapped animals into a new location is disruptive to the animal and it will probably die. It is less cruel to shoot the animal.
- **Repellants:** The most effective repellants for mammals are egg-based products but protection is limited to 6-8 weeks and new foliage developing during that period is unprotected. Repellants may also damage the leaves and reduce growth of the seedlings/saplings.
- **Palatability:** Some tree species are more attractive to native animals than others (see above). Choice of species can therefore be tailored to the suite of animals on your property. If you plant hardened seedlings, its foliage is also less attractive than that of unhardened seedlings. Retaining some between-row weed cover can provide an alternative source of food for browsing animals which may reduce damage, and planting some seedlings of species vulnerable to your browsing animals around your plantation may distract the animals from your crop trees. The effectiveness of these methods remains untested.
- **Tree guards:** Several types of tree guards are available, but only fluted extruded plastic tubes that are 1.2m high, are recommended for browsing control. Their effectiveness against browsing by possum is not proven. Tree guards should remain in place until the trees are just above the level of the tree guard (on average between 12-18 months for eucalypts and 18-24 months for pines and blackwood). Tree guards may also provide some protection from frost. The area immediately around the tree should be free of weeds with an appropriate residual herbicide in place before the guard is installed. Total cost of fluted plastic guards is relatively expensive and they are therefore more suited to smaller plantings.
- **Fencing:** Fencing erected to exclude domestic animals presents no barrier to native animals. Effective fencing is expensive but where browsing pressure is likely to prejudice the growth and survival of your trees, a suitable fence should be erected. All points of access to your plantation, including gates, culverts and water crossings should be properly covered. The cost per hectare of fencing will generally decline as the area enclosed increases. Various types of fence are available (*see Table 2*). All types of fence require maintenance and regular inspection for trapped animals.

**Table 2: The materials for various types of electric fencing for animals other than livestock**

Type	Effective against?
Netting with electric wire	All except deer
Electric plain wire	Native mammals/livestock
Electrified ringlock	Native mammals/livestock

- **Netting with electric wire:** To exclude possums as well as ground-based animals, a high tensile electrified wire is placed 100mm above the top wire of the netting. The bottom 100mm of the 1m netting is buried. A barbed wire can be placed 10cm above the electric wire to exclude Bennett's wallaby.
- **Electric plain wire fencing:** This fence uses insul timber posts (set 20m apart) and droppers in between. Several strands (usually 8 or 9) are used. At least three of these wires are 'hot'. The bottom wire is 50mm above ground level, and if electrified, it is essential to maintain the area immediately beneath the wire weed free. Glyphosate should be used, possibly in combination with a residual herbicide, as required.
- **Electrified ringlock:** Ringlock fences are very effective and require less vertical support than other fences (*see Figure 3*).

**Figure 3: An 8-horizontal wire ringlock fence**



For electrified ringlock fences (*Figure 3, Table 3*), treated pine posts are placed at 30m intervals. Two 1.5m insul timber droppers are driven in between the pine posts. The bottom strand is a plain earth wire, 50mm above the ground. The ringlock is hung 50mm above this wire with another earth wire 120mm above the ringlock. Three 'hot' wires are looped around the backs of the strainer posts to prevent access by possums.

Wallaby wire, a plain 11 wire fabricated ringlock type fence, provides a non-electrified alternative to the above electric fences. It will exclude most animals except possums and deer.

### Table 3: Materials for an electrified ringlock fence enclosing a 3ha plantation

The total length of fence was approximately 800m<sup>1</sup>. This fence (*see also Figure 3*) is based on a design by Gallagher Australia Pty Ltd, Smorgon Cyclone Rural and Private Forests Tasmania.

MATERIAL	NUMBER
8:90:30 Ringlock	5 rolls
2.5 Supaten plain wire (2km)	1.33 rolls
2.1m x 150mm treated pine posts	33
1.5m insultimber 'drive-in' posts	66
End insulators	65
Ties for insultimber	240
Joint clamps	10
End assemblies	5
Farm Gate	1

<sup>1</sup>Batteries and energisers not included. Steel boxes with a hinged steel lid should be used to accommodate batteries and energisers for this and all other types of electric fence.

### REFERENCES

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- Sustainable Timber Tasmania – 1990, Plantation Handbook, Edited by Neilsen, W.A., (Forestry Tasmania, Forestry Commission, Tasmania) (p 270).
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